

REMARKS

In response to the Official Action mailed September 4, 2002, Applicant amends his application and requests reconsideration. In this Amendment, claims 2, 3, 8, and 9 are cancelled leaving claims 1, 4-7, and 10 pending.

The invention concerns the making of a second contact, sometimes referred to in the patent application as a ball contact, in the course of wire bonding. In an initial contact formation, a ball is formed at the end of the wire and attached to a first conductive layer by conventional ball bonding. Then, the wire is fed through a capillary tip that is moved opposite a second conductive layer. There, unlike the known stitch bonding technique for attaching the wire, the wire is initially brought into contact with the second conductive layer and joined to the second conductive layer. Then, as described in the patent application, the capillary tip is raised, moved to one side, usually in the direction of the first conductive layer, and lowered to bend the bonding wire in a substantially 180° bend. This process may be repeated more than once as illustrated schematically in Figure 6 of the patent application. After the bending, the capillary tip presses the wire so bent into several layers against the second conductive layer. Thereafter, the capillary tip is raised and the wire is severed, producing a connection at the second conductive layer having the general appearance, in side view, shown in Figures 1 and 5 of the patent application.

In this Amendment, the remaining claims have been clarified. Claim 1, directed to the semiconductor device, describes the structure of the second contact more specifically than did examined claim 1. Claims 2 and 3 are cancelled as no longer necessary. Likewise, method claim 7 is made more specific by describing the bonding method summarized above and is described more accurately and in more detail as in the patent application. Claims 8 and 9 are also cancelled as no longer necessary since their limitations are encompassed within amended claim 7.

Claims 1-3 and 7-10 were rejected as anticipated by Fujihira (U.S. Patent 6,426,563). This rejection is respectfully traversed.

The structure and method described in Fujihira is totally different from what is described in claims 1 and 7, the two pending independent claims. Moreover, what is described in Fujihira is uncertain because of substantial lack of clarity in the description of that patent. It appears that Fujihira, in making the second connection with the bonding wire, crimps the bonding wire in the usual stitch bonding manner. In addition to that conventional arrangement, Fujihira also describes the presence of at least one of lower and upper conductive members 8 and 10, the structure, composition, and formation of which seems never to be described in Fujihira. In any event, because Fujihira fails to describe a folded wire contact like the second contact of claim 1

In re Appln. of Hideyuki Arakawa
Application No. 09/934,643

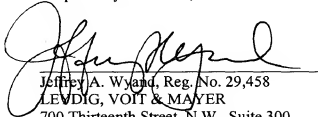
and the process of making such a folded wire contact as in claim 7, it cannot anticipate either of those claims nor claim 10.

Claims 4-6 were rejected as unpatentable over Fujihira in view of secondary sources of prior art. These rejections are respectfully traversed.

It is apparent that the rejection of claims 4-6 is founded upon the anticipation of claim 1 by Fujihira. In fact, that assumption is essential to the rejection of claims 4-6. Since, for the reasons already provided, there is no such anticipation, the rejection of claims 4-6 cannot be maintained.

Reconsideration and allowance of all remaining claims are appropriate and earnestly solicited.

Respectfully submitted,



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PATENT
Attorney Docket No. 401346/FUKAMI

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

HIDEYUKI ARAKAWA

Application No. 09/934,643

Art Unit: 2823

Filed: August 23, 2001

Examiner: H. Lee

For: SEMICONDUCTOR DEVICE AND
MANUFACTURING METHOD
THEREOF

AMENDMENTS TO SPECIFICATION, CLAIMS, AND ABSTRACT
MADE IN RESPONSE TO OFFICE ACTION DATED SEPTEMBER 4, 2002

Amendments to existing claims:

Cancel claims 2, 3, 8, and 9.

1. (Twice Amended) A semiconductor device, comprising:
a first conductive layer;
a first contact comprising a ball on said first conductive layer;
a second conductive layer spaced apart from said first conductive layer;
a second ~~ball~~ contact on said second conductive layer; and
a bonding wire connecting said first contact and said second ~~ball~~ contact, wherein
said second ~~ball~~ is formed by mechanically deforming contact includes at least two layers of
said bonding wire, lying directly on each other, said bonding wire including at least one
reverse bend.

7. (Twice Amended) A method of manufacturing a semiconductor device,
comprising, sequentially:
joining a ~~first~~ ball formed at a tip end of a bonding wire to a first conductive layer as a
first contact;
joining a first part of said bonding wire to a second conductive layer;
mechanically deforming a second part of said bonding wire ~~on said second conductive~~
~~layer, with~~ while said first part of said bonding wire is joined to the second conductive layer,

so that said bonding wire is folded onto said first part of said bonding wire directly opposite said second conductive layer; and

joining ~~the portion~~ said second part of said bonding wire ~~deformed~~ to said first part of said bonding wire on said second conductive layer.

10. (Twice Amended) The method of manufacturing a semiconductor device according to claim 7, wherein

said bonding wire is held by a bonding tool; and

mechanically deforming said bonding wire includes mechanically deforming said bonding wire on said second conductive layer by moving said bonding tool with said bonding wire ~~being~~ joined to said second conductive layer.



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Art Unit: 2823

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For: SEMICONDUCTOR DEVICE AND
MANUFACTURING METHOD
THEREOF

PENDING CLAIMS AFTER AMENDMENTS
MADE IN RESPONSE TO OFFICE ACTION DATED SEPTEMBER 4, 2002

1. A semiconductor device, comprising:
 - a first conductive layer;
 - a first contact comprising a ball on said first conductive layer;
 - a second conductive layer spaced apart from said first conductive layer;
 - a second contact on said second conductive layer; and
 - a bonding wire connecting said first contact and said second contact, wherein said second contact includes at least two layers of said bonding wire, lying directly on each other, said bonding wire including at least one reverse bend.
4. The semiconductor device according to claim 1, wherein
 - said first conductive layer includes an inner lead; and
 - said second conductive layer includes a bonding pad.
5. The semiconductor device according to claim 1, comprising
 - a base;
 - a semiconductor element on said base with a die pad interposed between said semiconductor element and said base;
 - a sealing resin sealing said semiconductor element; and
 - an external terminal on a rear surface of said base, wherein
 - said first conductive layer includes a land on said base, and
 - said second conductive layer includes a bonding pad on said semiconductor element.

6. The semiconductor device according to claim 1, comprising:
a base;
first and second semiconductor elements mounted on said base with a die pad
interposed between said base and said first and second semiconductor elements;
a sealing resin sealing said first and second semiconductor elements; and
an external terminal on a rear surface of said base, wherein
said first conductive layer includes a first bonding pad on said first
semiconductor element, and
said second conductive layer includes a second bonding pad on said second
semiconductor element.

7. A method of manufacturing a semiconductor device, comprising, sequentially:
joining a ball formed at a tip end of a bonding wire to a first conductive layer as a first
contact;
joining a first part of said bonding wire to a second conductive layer;
mechanically deforming a second part of said bonding wire, while said first part of
said bonding wire is joined to the second conductive layer, so that said bonding wire is folded
onto said first part of said bonding wire directly opposite said second conductive layer; and
joining said second part of said bonding wire to said first part of said bonding wire on
said second conductive layer.

10. The method of manufacturing a semiconductor device according to claim 7,
wherein
said bonding wire is held by a bonding tool; and
mechanically deforming said bonding wire includes mechanically deforming said
bonding wire on said second conductive layer by moving said bonding tool with said bonding
wire joined to said second conductive layer.